



PATENT SPECIFICATION

DRAWINGS ATTACHED

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Inventor: ERNEST URBAN LANG

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COMPLETE SPECIFICATION

Improvements in or relating to Rope Construction

We, NATIONAL-STANDARD COMPANY, of RFD # 1, Box 690, Prescott, Arizona, United States of America, a corporation organised and existing under the laws of the State of Delaware, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to the construction of rope and more particularly to rope composed of a number of strands wound around a rubber core.

An object of the invention is to provide a rope construction in which the rubber core has relatively high and low elongation characteristics before and after curing respectively.

According to the present invention there is provided a method of reinforcing a rubber body comprising making a rope by winding a plurality of metal strands in a spaced apart manner around a rubber core prior to the curing of the rubber core, embedding the rope in the rubber body, stressing both the rubber body and the rope so as to stretch the rope and then curing the combined rubber body and the rubber of the core, the rubber core having a sulphur and clay filler content such that it is easily extrudable before curing and after curing has a Shore Diameter A reading in the region of 75—80.

According to a preferred feature of the invention the rubber of the core is extrudable radially outwardly between the strands prior to the curing.

In order that the invention may be more readily understood preferred embodiments thereof will now be described with reference to the accompanying drawing in which:

Figure 1 is an end view of a section of the wire rope as initially formed;

Figure 2 is a fragmentary cross-sectional view of a rubber article in which the wire rope of Figure 1 has been embedded;

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Figure 3 is a fragmentary cross-sectional view which corresponds generally to Figure 2 and in which the wire rope is in tension; and

Figure 4 is a graph showing the elongation characteristics of the rope of our present invention under various conditions.

Referring now to Figure 1, there is indicated generally by the reference numeral 9 the wire rope of our present invention which, as initially formed, comprises a cylindrical core, indicated generally by the reference numeral 10, surrounded by a plurality of identical, circumferentially spaced apart, spirally wound, outer strands, each of which is indicated generally by the reference numeral 11.

The core 10, which may, by way of example, be about .030 inches in diameter, is formed of a hard tire bead stock 12 reinforced by a central filament or wire 13. The bead stock 12 preferably has a high sulfur and clay filler content so that before curing it is easily extrudable and yet after curing has a Shore Durometer A reading of 75—80. In the specific embodiment of our invention herein disclosed, the reinforcing wire 13 is about .010 inches in diameter and is formed of a material having a very low tensile strength and high elongation properties. A low carbon annealed steel wire has been found to be particularly suitable for this application, although other materials may be used, as for example, nylon strands.

The outer strands 11, which number six in the particular embodiment of our invention disclosed herein, each preferably comprises seven spirally wound wires 14, which individually are .006 inches in diameter. The wires 14 are formed of .70 carbon, hard drawn steel and have a tensile strength of approximately 400,000 psi.

To form the rope 9 of Figure 1, wires 14 are first formed into strands 11 by means of a conventional strand forming machine, and then the resultant strands 11 and a core 10

passed through a conventional closer. During the latter operation, the reinforcing wire 13 serves to strengthen the bead stock 12 so that the core 10 may be passed through the closer in a customary manner. In this connection, we have found that a core of unreinforced bead stock is not sufficiently rigid to be passed through a closer in a manner necessary to form the rope of our present invention.

The rope 9, as shown in Figure 2, is adapted to be embedded in a rubber body 15 which may, for example, be part of a tire carcass. As contrasted with bead stock material described hereinbefore, the tire carcass material after curing has a Shore Durometer A reading of 50—60. The rope 9 is fabricated with the tire carcass material 15 while both members are in an uncured state. When the rope 9 is uncured, it has high elongation properties; as shown by Curve D in Figure 4, the uncured wire rope 9 has 4.75% elongation under a load of 400 pounds.

As the tire carcass 15 is expanded into a tire mold, tension is imposed on the rope 9 embedded therein. The magnitude of the tensile force will depend upon the degree of expansion of the carcass 15 and the location of the rope 9. In response to tension, the rope 9 will tend to elongate as the lay of the strands 11 changes and the core 10 extrudes radially outwardly between the strands 11. Under relatively low tension, the core 10 will extrude radially outwardly only slightly from its normal periphery shown in Figure 2; under relatively high tension, the strands 11 will move radially inwardly and the core 10 will extrude radially outwardly substantially to fill the spaces between the strands 11 as shown in Figure 3. Although we have shown only one rope 9 in the carcass 15, it will be readily appreciated that in the molding of a conventional tire, a plurality of ropes 9 are embedded in the carcass 15. Due to the unique properties of the ropes 9, each is free to elongate a different amount in response to the differing tensions at various locations about the carcass 15.

After the tire carcass 15 has been fully expanded into the tire mold, both the carcass 15 and the bead stock 12 of the core 10 are cured. Thereafter, since the core 10 can no longer extrude radially outwardly, the rope 9 assumes the characteristics of a steel core wire rope. As graphically shown by Curves A, B and C in Figure 4, when the rubber core of rope 9 is cured under tension, varying from one to forty pounds, the per cent elongation of the rope under a load of 400 pounds is less than one-half of the per cent elongation of the wire rope under a corresponding load prior to curing.

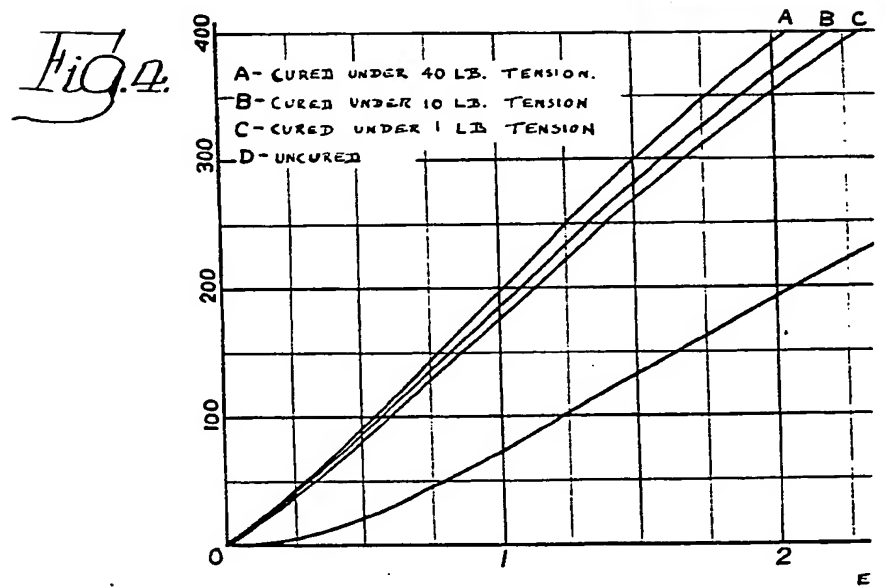
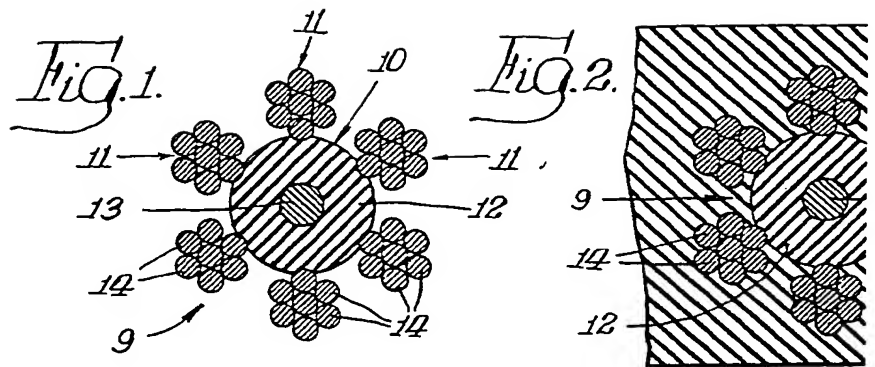
From the foregoing description, it will be noted that we have provided a unique type of rope which has relatively high elongation properties before curing and relatively low elongation properties after curing. It will also be understood that the incorporation of our rope in a tire carcass obviates the great accuracy and care heretofore required in building wire-reinforced rubber tires. Finally, applications for our rope in other fields wherein similar problems may exist will suggest themselves to those skilled in the art.

While we have shown and described a preferred embodiment of our present invention, it will be readily apparent to those skilled in the art that various modifications and rearrangements may be made therein without departing from the scope of our invention as claimed.

WHAT WE CLAIM IS:—

1. A method of reinforcing a rubber body comprising making a rope by winding a plurality of metal strands in a spaced apart manner around a rubber core the rubber core having a sulphur and clay filler content such that it is easily extrudable before curing and after curing has a Shore Durometer A reading in the region of 75—80. prior to the curing of the rubber core, embedding the rope in the rubber body, stressing both the rubber body and the rope so as to stretch the rope and then curing the combined rubber body and the rubber of the core.
2. A method according to claim 1, in which the rubber of the core is extrudable radially outwardly between the strands prior to the curing.
3. A method according to claim 2 in which a reinforcing wire of low tensile strength and high elongation extends through the core.
4. A method according to claim 3 in which the diameter of the core is approximately 0.030 inch and the strands comprise 0.70% carbon hard drawn steel and have a diameter of approximately 0.006 inch.
5. A method according to claim 3 or claim 4, in which the reinforcing wire is a low carbon annealed steel wire of 0.010 inch diameter.
6. A rubber body incorporating a rope when made by a method according to any preceding claim.
7. A method of reinforcing a rubber body substantially as hereinbefore described with reference to the accompanying drawings.

POLLAK, MERCER & TENCH,
Chartered Patent Agents,
Audrey House, Ely Place,
London, E.C.1.
Agents for the Applicants.



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COMPLETE SPECIFICATION

1 SHEET

*This drawing is a reproduction of
the Original on a reduced scale .*

